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AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

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New Horizons in Nitrogen*

By ARTHUR M. SMITH

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THE FIRST world consciousness of a nitrogen problem was that of shortage, culminating in predictions of the ultimate starvation of the human race at the end of a losing conservation economy. When commercial fixation of atmospheric nitrogen was established extensively, the picture changed to one of competition for the known existing markets. Sales pressure reduced prices and stimulated research for new uses, both industrial and agricultural. The broadening uses and markets for nitrogen increased steadily, until in the summer of 1939 there was evidence that utilization might soon equal the then existing production capacities.

The present war, emphasizing national needs, has created new national production capacities in the United States and in many other countries. In the United States, and collectively throughout the world, these new production capacities vastly exceed all previously known peacetime requirements for nitrogen. Moreover, many of these factories, strategically and economically located with reference to raw materials, will establish new record low costs of production.

Prewar Distribution in the United States

In the fiscal year 1929–30 the total nitrogen used in fertilizers was 316,000 tons (N), of which 65 per cent was in mixed fertilizers and 35 per cent was used as materials. In the year 1931–32 this had dropped to 182,000 tons (N), owing to the depression and a reduced demand for fertilizers. By 1935–36 it had increased to 317,000 tons, 52 per cent in mixed fertilizers and 48 per cent as materials.

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The year 1937–38 may be considered as free of war influence and probably representing a permanent minimum level of use. In that year United States agriculture used approximately 356,000 tons of nitrogen of chemical origin, industry used approximately 144,000 tons, and exports amounted to 43,000 tons. The total consumption of chemical nitrogen was 543,000 tons. The imports for that year were about 192,000 tons. With due allowance for carryover of stocks, it is apparent that United States production of chemical nitrogen had reached a level of between 350,000 and 375,000 tons of nitrogen per year, with some unused capacity above that figure.

Agriculture has normally consumed from 2.5 to 3.0 times as much nitrogen per year as was used for all industrial purposes. The expansion of production facilities to meet the war needs presents a postwar problem that is both a challenge and an opportunity to all chemists and agronomists who are experienced in the production and use of nitrogen compounds.

Postwar Nitrogen Picture

The postwar picture includes the enlarged capacities of the prewar commercial nitrogen plants, both by-product and synthetic; the possibility that the Government-owned war plants may be operated sufficiently to maintain them in first-class operating (not standby) condition; and imports. Imports from Chile will probably continue; those from Canada may, due to increased production capacities, be in larger volume than during the prewar years.

We may anticipate in the postwar years a production capacity of approximately twice

our recent prewar consumption, and perhaps equal to three times our prewar production capacity. Production will be large, supply will exceed demand, prices will be lower; and competition will be keen. Old types of nitrogen materials will be seeking new outlets and new types of materials will be developed for specific uses. Chemists of the nitrogen industry and of the fertilizer industry will be asked to do their part to help more people benefit by a larger use of nitrogen-containing products.

It is not too early for research chemists, or operating chemists who can devote part of their time to future work, to give thought to plans for meeting the opportunities and responsibilities of a larger nitrogen production.

The Need for Research

Many new uses for nitrogen compounds will be found; but it will require the best that can be done to convert this necessary wartime production capacity to its optimum peacetime utilization.

Nitrogen plants located in or near the soft-coal fields, and using the steam-coke process for hydrogen, could be operated partly or even entirely to produce methanol. To the extent that this is done they would be removed from nitrogen production, and thereby reduce the apparent surplus. It would also relieve in part the drain on our mineral oil resources since methanol is a good motor fuel.

New industrial procedures in which nitrogen is used in processing the products of other industries, new nitrogen compounds both mineral and organic, and new products containing nitrogen have developed at such a rapid rate in recent years that the war has, in its net effect, retarded rather than stimulated industrial uses for nitrogen other than in explosives. In the postwar years it is to be expected that this trend will be resumed, and will rapidly increase the industrial nitrogen requirements. At present a conservative estimate would be approximately 35 per cent over prewar levels; but the probabilities point to a doubling of the prewar industrial consumption within ten postwar years.

The wartime problems of substitutions and the use of alternative materials and products are giving many valuable research leads, that will later be developed into new and competitive productions.

But even with the most that can be done in diverting nitrogen plant capacities to other products, and in developing new industrial processes and products to use nitrogen, there will remain the problem of and the opportunity for a greatly increased use of nitrogen in agriculture at lower prices.

In agriculture, as in industry, the price per pound of nitrogen to the users is an important factor in determining its use and the quantity consumed annually. The effect of nitrogen at 10 cents or less per pound to the consumer cannot be adequately estimated at this time; but the trend will be toward a more liberal use of all forms of nitrogen. All research workers in charge of field experiments, and all who administer the research budgets, should review the data from the varying rates of application of nitrogen, and recalculate the most profitable rates of application on the basis of lower cost nitrogen in relation to both minimum and maximum crop prices during recent years.

The agricultural possibilities are, however, not limited merely to the use of more nitrogen per acre on crops that usually receive nitrogen in the fertilizer. In the milk-sheds of the large cities low-cost chemical nitrogen has been converted into digestible protein at a profit by the use of nitrogen fertilizers in the intensive system of pasture management. With nitrogen delivered to the farms at lower prices during the postwar years this use will undoubtedly increase and may be found profitable even for beef cattle and other livestock.

In Europe, from 1920 to 1930, when increasing quantities of nitrogen fertilizers were seeking a market, it was found that many varieties of grain were incapable of utilizing the heavier applications of nitrogen. Plant breeders developed new strains and hybrids with shorter thicker stems to hold the heavier heads without lodging until ripe for the harvest. Plant breeding work of this type requires several seasons; and it would seem practical to canvass the experiments now in progress to determine what needs to be done.

Major changes in processes, prices, and production capacity of any fertilizer material have always influenced American fertilizer manufacturing methods. A vastly increased production of nitrogen at lower cost, sold at lower prices, will undoubtedly influence fertilizer mixing practice.

Sanitation in the slaughterhouses that made tankage available as a feed material; the introduction of cyanamide; the rapid development of by-product coke ovens during World War I; the introduction of hygroscopic synthetic nitrogen materials; the marketing of anhydrous ammonia, liquors, and solutions; the substitution of 60 per cent muriate for kainite, manure salts, and 50 per cent muriate; the gradual elimination of most of the materials that contained appreciable amounts of the minor and trace elements—each of these in turn has caused changes in fertilizer factory

methods and practice, and most of them within the memory of those now active in the work.

The significance, if any, of the trend in the percentage of fertilizer nitrogen applied in mixed fertilizers and as materials is worthy of careful study by all chemists in the fertilizer industry. In the year 1925–26, 65 per cent of the nitrogen was used in mixed fertilizers and 35 per cent as materials; in 1940–41, 54 per cent was used in mixed fertilizers and 46 per cent as materials. Is the answer in the field of the chemist or of the economist; or both? Is it due to inability to obtain satisfactory condition of the mixed fertilizer when high nitrogen percentages are included, or to the real or supposed reversion of phosphoric acid? To what extent is it due to the pressure of increased quantities of low-cost mineral nitrogen seeking a market, faster than the industry could learn how to put it in the complete fertilizer, or faster than salesmen could sell the farmers on higher nitrogen in complete fertilizers?

Whatever the answer, this problem will again be demanding attention. Now, while there is time for careful planning and research, is the time to consider the problem and how to meet it, to the national advantage, to the advantage of chemists and business men, and to the advantage of farmer customers.

Complete Uniformity Impossible

The fertilizer industry has often been accused of being unprogressive in its manufacturing methods and unwilling to change, and of failing to take advantage of new chemical processes and procedures. These accusations are not warranted by the facts. The fertilizer industry has made many changes; and as an industry has always been willing to change whenever there were sound business reasons for so doing.

There is not and probably never will be complete uniformity of methods in the manufacture of complete fertilizers. The probabilities are that in future the diversity of methods will be even greater than heretofore. Waste materials and by-products that would not otherwise be used will always find an outlet in mixed fertilizers. That, in itself, keeps the fertilizer industry, as an industry, from becoming completely chemical.

However, the day of a vertical integration of complete fertilizer production by one or more operators within the industry is not far distant. Such a vertical integration in plants located to avoid backtracking of freights on raw materials and finished product, the transportation of inert material, and the duplication of overhead and traveling expense, will eventually restrict semichemical methods of manufacture to localities where the waste materials and usable by-products originate, or to the nearest fertilizer-consuming areas.

Nitrogen factories located in the natural gas fields on or near the Gulf Coast would have the advantage of low-cost fuel and low-cost hydrogen from natural gas; in short, fixed nitrogen at a cost low enough to acidulate phosphate rock with nitric acid; where the phosphate rock and potash could converge at the nitrogen factory at a minimum cost for transportation; and from where the product would go by low-cost water transportation to the consuming areas. However, this vertical integration of the fertilizer industry need not necessarily be confined to any one area. There is much more research that can be done to determine what method of using ammonia, nitric acid, urea, and cyanamide is best suited to prepare it for fertilizer use. Fertilizers have been mixed by the present procedures because such procedures have thus far proved to be the most practical and economical. Probably these same procedures will continue in use for many years.

Need for a National Nitrogen Policy

We are now experiencing what is undoubtedly the last serious nitrogen shortage this country will ever know. We are all agreed that never again shall this country have a total production capacity less than that required for all normal peacetime purposes plus whatever a sound military policy requires for war purposes. Because nitrogen is munitions as well as food and a great variety of useful articles of manufacture, it is necessary to have a national nitrogen policy which will take into consideration the recorded usage of nitrogen, its relation to population trends, and its relation to the national and international policies of our Government.

To make such a national policy really effective, our nitrogen-production capacity at the close of the war should be kept as nearly as possible in first-class operating condition, including by-product, prewar, and wartime plants. How best this can be done will require careful study by many people; but we can give some thought to the possibility of such minimum-scale operation of every plant as to prevent deterioration. This much is certain, that to the extent to which we as chemists and/or agronomists can develop new and increased uses for nitrogen on a sound economic basis, we shall be serving our country.

Boron and Potash for Alfalfa in the Northeast*

By A. F. GUSTAFSON

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OVER a period of several decades, Northeastern farmers have suffered considerable losses as a result of certain disorders, often called diseases, of alfalfa, fruits, and vegetables. The disorder of alfalfa, called "yellow top," was described by Stewart, French, and Wilson[1] at Geneva, New York, in 1908. Thirty years later, McLarty, Wilcox, and Woodbridge[2] cured "yellow top" by an application of boron. The following year, Willis and Piland[3] reported improvement in the growth of alfalfa as a result of an application of boron. Now, yellow tip is known to result from deficiency of available boron in the soil, or from conditions that interfere with normal functioning of boron in the plant. Calcium induces boron deficiency in certain cases, but how is not clear. Kitchen, in the November 1942 number of this Journal, indicated the areas in the United States, including the Northeast, in which boron deficiency for one or more crops is definitely known.

One of the earliest, if not actually the first, to use borax for alfalfa in this section was Ray Bender, County Agricultural Agent in Essex County, New Yrok. He put on 10-, 15-, and 25-pound-an-acre applications of borax to newly established alfalfa in 1937. The borax produced marked increases in yield of hay and materially extended the life of the stand. The use of potash also proved beneficial to alfalfa on the sandy soil selected by Bender for this test.

Many New England agronomists have already reported good results from the use of boron and potash on alfalfa. Borax was applied with and without the other trace elements on alfalfa by the Agronomy Department in New York in 1940. In the fall of that year and in 1941, Colwell,[4] working on a boron fellowship applied borax and potash to alfalfa that showed signs of boron or potash deficiencies in a number of New York counties. The tests were designed to indicate whether boron or potassium or both were deficient. In some of these rests, the quantity of potash applied proved inadequate to supply the needs of alfalfa. In other tests, applications of 400 and 800 lbs. of muriate of potash an acre produced such marked increase in yield of alfalfa hay that the farmer, on whose land this test was located last fall, treated alfalfa on an entire field of the same type of soil (a loam) with 400 lbs. of muriate to the acre.

Although few yield data were taken, Colwell's work indicated that an application of 20 to 40 lbs. of borax to the acre is sufficient for alfalfa on some soils in New York. Up to 100 lbs. an acre, evenly distributed, was not injurious to alfalfa nor did such heavier applications prove more beneficial than 40 lbs. an acre. It should be stated, however, that borax does not increase alfalfa yields on all New York soils.

The oat crop is particularly sensitive to boron injury, when borax is applied with the fertilizer in direct contact with the oat seed. In a test in Franklin County, New York, borax markedly retarded the germination of oats. When the grain was mature, however, one could not distinguish between the borax-treated and the no-borax plots on the basis of the appearance of the grain. It appears, therefore, either that boron simply delayed germination or that the treated oats tillered to such an extent as to produce a good stand and what appeared to be a satisfactory yield of grain.

The effect of borax (plots in duplicate) on the yield of a mixture of oats and barley was determined on the productive Honeoye silt loam on the Soil Conservation Service Experimental Farm near Marcellus, New York. Part of the farm is used for agronomic experimental work by the Agronomy Department of the Cornell University Agricultural Experi-

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* Reprinted from "Better Crops with Plant Food," March, 1943.

[1] Stewart, F. C., G. T. French, and J. K. Wilson. *Troubles of Alfalfa in New York*. New York Agr. Exp. Sta. Geneva Bul. 305, 1908.

[2] McLarty, H. R., J. C. Wilcox, and C. G. Woodbridge. *A Yellowing of Alfalfa Due to Boron Deficiency*. Sci. Agr. 17:515–517. 1937.

[3] Willis, L. G., and J. R. Piland. *A Response of Alfalfa to Borax*. Jour. Amer. Soc. Agron. 30:63–67. 1938.

[4] Colwell, W. E. *A Biological Method for Determining the Relative Boron Content of Soils and Chemical Studies on Certain Metaborates*. Unpublished thesis, Cornell Univ. 1942.

ment Station. The yield of grain without borax was 1860 lbs. to the acre. With 20 lbs. of borax to the acre, the yield was 1420 lbs.; with 40 lbs. 1170 lbs.; and 100 lbs. of borax, 420 lbs. of grain to the acre. From these meagre data, one may draw only tentative or provisional conclusions. For the present, however, it may be stated definitely that borax should not be allied in direct contact with oat and barley seed. If needed for alfalfa, boron may be broadcast after the nurse-crop grain has been harvested.

In applying borax on alfalfa in a vegetative state, care should be exercised to distribute it uniformly. Temporary burning of both alfalfa and clover on light soils has been observed in parts of fields to which 60 lbs. of borax an acre were applied. This damage was caused by the absorption of boron through the roots of the plants. Had the distribution been uniform, it is not believed that any damage would have been produced.

This observation, however, suggests that borax be applied for alfalfa before growth begins in the spring or immediately after the first or second cutting of the crop, and before much growth has been made. However, with care, borax may be put on safely at any stage of growth. The plants should be dry so thag little borax adheres to the leaves. Upon going into solution in dew or rain water, adhering crystals of borax may cause temporary burning of the leaves. Mixing borax with moist sand or other inert material and sowing it by hand proved entirely successful on 1/20-acre test plots. No burning was noted in any case. For larger areas, application of borax alone by means of seeders of the cyclone, the wheelbarrow, or other types appears feasible.

Application in Fertilizers

In the case of larger areas or entire fields that require additional treatment for alfalfa, vorax may be mixed with such material and applied simulaaneously. On land known to be deficient in both potash and boron for alfalfa, borax may be mixed with muriate of potash and applied on one operation. Or if superphosphate is to be used as a top-dressing, although not the best way, borax may be mixed with the phosphate and the mixture put on with the ordinary fertilizer distrubtor.

The writer spent July and parts of August and September 1942 in northern New York; July, mainly, in St. Lawrence County. The phase of the work to be reported on here was a study of hay crops, particularly alfalfa and clover. Up to the beginning of this study, no specific difficulty with these crops, except potash deficiency, had been reported.

The first crop of alfalfa had not been harvested from many fields. In one of these fields, that of Ralph Wallace, a mild case of yellow top was noted. Soon thereafter, yellow top was found on the second growth in many fields, particularly on Madrid loam. (Madrid loam is well drained and contains an abundance of calcium carbonate in the sub-soil and often in the surface as well.) The onormal precipitation of June had given way to a period of very light rainfall. On July 11, Country Agent Cary and the writer put borax at the rate of about 30 lbs. an acre on a plo of Wallace's alfalfa. Up to that date, potash deficiency had bnot been noted. It showed up later, however, and potash was applied on July 17 at the rate of 400 lbs. of 50 per cent muriate to the acre. During the remainder of July, rainfall continued far below normal. Symptoms of severe boron deficiency became common on this type of soil throughout the county. Potash deficiency also occurred commonly, not only on the Madrid soils but on other sandy ones as well.

Ten tests in all were established by the writer; all but one of them involved the application of both boron and potash. Boxax was put on at the rate of 40 lbs. an acre on a strip 2 rods wide and 4 rods long, and 400 lbs. of muriate of potash to the acre were applied to a strip of the same size. The two strips overlapped one-half. The tests, therefore, consist of a strip of alfalfa treated with boax alone, one with both borax and potash, and another with potash alone. All fields had received reasonably adequate amounts of phosphorus for good growth of alfalfa.

Results From Treatments

The potash-deficiency symptoms disappeared generally only a few days after sufficient rainfall to dissolve and carry the potash into the scil. It appears that sufficient rain fell on the Wallace farm soon after July 11 to carry the boron to the roots of the alfalfa, because, only two weeks later, the boron-treated alfalfa was taller and greener than the untreated. In the meantime, distinct boron-deficiency symptoms developed on the untreated alfalfa, but no yellow top was seen on that treated with boron. By the end of July, the born-treated alfalfa had much more bloom and had made considerably taller growth than the untreated alfalfa.

This alfalfa was harvested on August 25, six weeks after borax was put on. Because of

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Ceiling on Superphosphate Prices to Fertilizer Manufacturers Established

SPECIFIC dollars-and-cents maximum prices, uniform to all sellers at each producing point in the United States, were established on March 24th by the Office of Price Administration for all grades of superphosphate in order to correct price inequalities at the wholesale level.

The new maximums reduce some ceilings previously established at March, 1942, levels by the General Maximum Price Regulation. In other cases, slight increases are authorized to bring about a more equitable condition in the industry.

Consumer prices will not be affected by the current action which only governs prices producers may charge to other fertilizer manufacturers or mixers.

Superphosphate sold by the producer direct to fertilizer dealers or consumers is priced under Revised Maximum Price Regulation No. 135.

Both ordinary and triple superphosphate are covered by the new maximums, and a formula is provided for the establishment of ceiling prices for any grade more concentrated than ordinary but not meeting the customary standards for triple superphosphate.

The wording of the amendment is as follows:

(i) *Bulk sales of ordinary superphosphate.* The maximum price a producer may charge for ordinary superphosphate (containing less than 22 per cent available phosphoric acid) for sale in bulk to fertilizer manufacturers or mixers shall be:

(*a*) *Pulveri ed superphosphate.* (*1*) For sales of run-of-pile, basis f. o. b. cars at each producing point, the price specified for that point as listed below:

Point of production	*Maximum price per unit of available phosphoric acid*
Lowell, Massachusetts	$.75
North Weymuth, Massachusetts	.75
Woburn, Massachusetts	.75
Buffalo, New York	.70
Carteret, New Jersey	.69
Paulsboro, New Jersey	.67
Philadelphia, Pennsylvania	.67
Baltimore, Maryland	.64
Alexandria, Virginia	.64
Lynchburg, Virginia	.64
Norfolk, Virginia	.63
Portsmouth, Virginia	.63
Richmond, Virginia	.64
Acme, North Carolina	.62
Charlotte, North Carolina	.62
Durham, North Carolina	.62
Greensboro, North Carolina	.62
Laurinburg, North Carolina	.62
Navassa, North Carolina	.59
Selma, North Carolina	.62
Wadesboro, North Carolina	.62
Wilmington, North Carolina	.59
Wilson, North Carolina	.62
Anderson, South Carolina	.62
Charleston, South Carolina	.55
Columbia, South Caro ina	.60
Greenville, South Carolina	.62
Hartsville, South Carolina	.62
Lancaster, South Carolina	.62
Spartanburg, South Carolina	.62
East Tampa, Florida	.50
Jacksonville, Florida	.53
Nichols, Florida	.50
Pierce, Florida	.50
Dallas, Texas	.70
Houston, Texas	.68
Little Rock, Arkansas	.70
Texarkana, Arkansas	.70
Calumet City, Illinois	.68
Chicago Heights, Illinois	.68
East Saint Louis, Illinois	.63
Fort Wayne, Indiana	.68
Indianapolis, Indiana	.68
New Albany, Indiana	.65
Detroit, Michigan	.70
Lansing, Michigan	.70
Cincinnati, Ohio	.65
Cleveland, Ohio	.68
Columbus, Ohio	.68
Lockland, Ohio	.65
Sandusky, Ohio	.68
Silica, Ohio	.68
Toledo, Ohio	.68
Washington Court House, Ohio	.68
Stege, California	.84
Vernon, California	.84

(*2*) For sales of run-of-pile, basis f. o. b. cars at buyer's destination within a delivery area as described below from any producing point listed as a price basing point for that area, a price equal to the price f. o. b. the one of the price basing points listed plus the cost of transportation by rail in carload lots from that price basing point to the buyer's destination which will result in the lowest net delivered cost to the buyer, such transportation

cost to include the 3 per cent tax thereon imposed by §620 of the Revenue Act of 1942:

Delivery Area No. 1

The price basing points for area No. 1 are confined to the State of Georgia and maximum price per unit of available phospheric acid and basing points in area No. 1 are:—Albany, Americus, Athens, Atlanta, Augusta, Columbus, East Point, La Grange, Macon, Pelham, Rome, Tifton, and Valdosta, all 61 cents per unit; Savannah, Ga., 55 cents per unit.

Delivery Area No. 2

The delivery area No. 2 consists of the States of Alabama and Florida west of the Apalachicola river. The basing points in this area are:—Pensacola, Fla.; Bessemer, Ala.; Birmingham, Ala.; Dothan, Ala.; Florence, Ala.; Mobile, Ala.; Montgomery, Ala.; Roanoke, Ala.; Troy, Ala., and Nashville, Tenn. The maximum price per unit of available phosphoric acid at all basing points is 60 cents per unit.

Delivery Area No. 3

Delivery area No. 3 is made up of the States of Mississippi and Louisiana. The following base points take a maximum price of 62½ cents per unit available phosphoric acid:—Gulfport, Miss.; Hattieburg, Miss.; Jackson, Miss.; Tupelo, Miss.; New Orleans, La.; Harvey, La.; Shreveport, La.; Shrewsbury, La. The following take 60 cents per unit:—Pensacola, Fla., and Nashville, Tenn.

Delivery Area No. 4

Delivery area No. 4 consists of the States of Tennessee and Kentucky. The basing points and maximum price per unit of available phosphoric acid are:—Chattanooga, Tenn., 63 cents; Greenville, Tenn., 63 cents; Knoxville, Tenn., 63 cents; Memphis, Tenn., 60 cents; Mt. Pleasant, Tenn. 60 cents; Nashville, Tenn., 60 cents, and Wales, Tenn., 60 cents.

A producer, selling for delivery outside an area for which his producing point is listed as a price basing point, or selling to a buyer who does not specify a point of destination at the time of the sale, may charge a price, basis f. o. b. cars at producing point, no higher than the price specified for that producing point.

(*3*) For sales of superphosphate guaranteed by the producer to contain 18 per cent, 19 per cent, or 20 per cent available phosphoric acid, with no charge for over-run, the maximum price as established under (1) or (*2*) plus $.015 per unit of available phosphoric acid guaranteed.

(*b*) *Granulated superphosphate.* The maximum price as established under (1), (*2*), or (*3*) above plus $.02 per unit of available phosphoric acid.

(ii) *Bulk sales of triple superphosphate.* The maximum price a producer may charge for triple superphosphate (containing 40 per cent or more available phosphoric acid) for sale in bulk to fertilizer manufacturers or mixers shall be:

(*a*) In the states of Washington, Oregon, California, Nevada, Utah, Idaho, Montana, Wyoming, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Arizona, and New Mexico, a price of $.885 per unit of available phosphoric acid, basis delivered to the point of destination designated by the buyer, except that the actual cost of transportation and the 3 per cent tax thereon imposed by §620 of the Revenue Act of 1942, from Anaconda, Montana, to the point of destination, in excess of $8.03 per ton of 2000 pounds may be charged to the account of the buyer.

(*b*) In the other states of the United States and in the District of Columbia, a price per unit of available phosphoric acid, basis f. o. b. railroad cars at the point of production, of:

(1) $.70 for any producing point in Montana or Tennessee;

(*2*) $.65 for any producing point in South Carolina;

(*3*) $.62 for any producing point in Florida;

(*4*) For any producing point located in the District of Columbia or in any state other than Montana, Tennessee, South Carolina or Florida, $.62 plus the cost per unit, of transportation by rail in carload lots, of 48 per cent superphosphate from East Tampa, Florida to that producing point, such transportation cost to include the 3 per cent tax thereon imposed by §620 of the Revenue Act of 1942.

(iii) *Bulk sales of double superphosphate.* The maximum price per ton which a producer may charge, basis f. o. b. railroad cars at his plant, for double superphosphate (containing 22 per cent or more but less than 40 per cent available phosphoric acid) for sale in bulk to fertilizer manufacturers or mixers shall be:

(*a*) The product of 20 units of available phosphoric acid times the price per unit for a guaranteed grade of ordinary superphosphate, basis f. o. b. cars at producing point (i) (*a*) (*3*), plus

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Principal Articles in This Issue

Fertilizer Grade Conferences

Raleigh, N. C.

A meeting to discuss the North Carolina 1943–44 fertilizer grades to be recommended to the Food Production Administration was held March 29th at Raleigh, N. C. The meeting was called by D. S. Coltrane, assistant to the Commissioner of Agriculture, and was attended by about 50 individuals representing the Department of Agriculture, the Agricultural Experiment Station, the State Legislature, the State Grange, farmers, and fertilizer manufacturers. Director Baver of the Experiment Station presented a list of 22 grades, the minimum number required by the State law. Fertilizer manufacturers suggested that the shortage of labor made it desirable to keep the list of grades to be shipped as short as possible to meet the actual need. After considerable general discussion Mr. Coltrane appointed a committee of five farmer representatives and five fertilizer manufacturers to continue the discussion with State Department and Experiment Station officials. In the meeting of this committee with the officials the suggested grades were discussed in detail and individual opinions expressed as to which should be eliminated. No formal action was taken as the matter of recommendation is in the hands of the Experiment Station officials.

Columbia, S. C.

The grade conference which was held in Columbia, S. C., on April 6th was well attended both by the industry and by agricultural workers. D. Houser Banks, district chairman, presided. Charles J. Brand made a brief statement as to fertilizer supplies and outlook, calling on Dr. H. B. Mann of the American Potash Institute to present data on estimated potash requirements and deliveries. It developed that, owing to heavy demand, there is at present some local shortage of superphosphate, but total fertilizer sales for the State will be considerably above the past year.

Dr. H. P. Cooper presented a list of grades on behalf of the agronomists and horticulturists of the Agricultural College, Extension Service, and Experiment Station. After a very full discussion by the industry, and slight modification, the following list of grades was recommended: 3–12–6, 3–9–6, 3–9–9, 4–8–8, 4–12–4, 5–10–5, 6–8–6, 6–9–3 (for tobacco plant beds), 4–16–0, 0–14–7, 0–12–12, and a top-dresser to be either 12–0–12 or 10–0–10. T. L. Jefferies, field representative, Food

Production Administration, stated that producers in South Carolina had cooperated fully and that very few complaints were coming from farmers.

Atlanta

The Georgia grade conference held in Atlanta on April 5th was attended by producers representing all sections of the State, by agronomists, and other agricultural workers. R. L. King, district chairman, presided, and the grades recommended by the agronomists of Georgia State College and the two State Experiment Stations were presented by Prof. E. C. Westbrook.

After full discussion, in which many members of the industry participated, the following grades were recommended: 0–14–10, 2–12–6, 3–9–6, 3–9–9, 4–10–6, 4–12–4, 6–8–6, and 10–0–10 for field crops, vegetables, and fruits; and 3–9–6, 3–9–9, 4–9–3, and 4–2–10 for tobacco. After review by the State USDA War Board the grades selected will be recommended to the Food Production Administration. Charles J. Brand made a brief statement in reference to the fertilizer supply situation and outlook; J. E. Nunnally, Field Representative of the Food Production Administration, stated that manufacturers of Georgia have done their best to comply with FPO 5; H. R. Smalley commended the work done by the agronomists; and T. R. Breedlove, chairman of the State USDA War Board, stated that there had been few complaints from farmers.

Freight Rate Increases Suspended

The Interstate Commerce Commission has suspended, effective May 15, railroad freight increases, averaging 4.7 per cent authorized a year ago to offset higher wages granted railroad workers by a presidential mediation board. The Commission stated that earnings had so increased as a result of a larger volume of traffic that the freight rates as so reduced will be "just and reasonable." The suspension was made effective until January 1, 1944, the Commission indicating that developments during the year would determine action to be taken on that date. . . . Truck rates were not affected.

List of Labor-Shortage Areas Increased

Several fertilizer manufacturing centers are affected by the recent order of the Regional Directors of the War Manpower Commission which added to the areas designated in General Order 5, the following: Burlington, N. C.; Wilmington, N. C.; Evansville, Ind.; Tampa, Fla.; Savannah, Ga.; and the area immediately south of Chicago. The order makes these areas subject to the provisions of Executive Order 9301, which establishes a minimum wartime work week of 48 hours.

Decline in Proportion of Farm Income Spent for Fertilizer

From 1940 to 1942 the net income of farm operators more than doubled. This was in spite of the marked increase in farm production, costs, and wages paid.

Gross income and net income in 1942 were both substantially above the peaks of 1920. Income and production expenses in each of the last six years and in several selected earlier years are shown in the following table. All of the figures are compiled from the reports of the U. S. Department of Agriculture.

The sharp rise in farm income in 1942 was due to the largest production on record and an unusually high price level. An all-time peak in fertilizer consumption contributed to the large production. As indicated by the table, expenditures for fertilizer and lime were the largest for any year since 1920. Although such expenditures in 1942 were well below 1920, the amount of plant-food contained was 53 per cent greater than in 1920.

Even though there was more fertilizer used in 1942 than in any other year, the proportion of farm income required to purchase it was the smallest in many years. Purchase of fertilizer and lime last year required only 17 cents of every $10.00 of income.

FARM INCOME AND PRODUCTION COSTS

(Figures in Millions of Dollars)

	Gross Farm Income	Cost of Fertilizer and Lime	Total Farm Production Expenses	Net Income of Farm Operators*
1910	7,352	149	3,599	3,904
1914	7,638	208	4,120	3,944
1920	15,903	382	9,130	7,126
1925	13,567	250	7,464	6,010
1929	13,824	293	7,780	5,878
1932	6,406	125	4,574	1,872
1937	11,275	248	6,155	5,333
1938	10,083	226	5,801	4,287
1939	10,564	240	6,193	4,478
1940	11,043	260	6,464	4,675
1941	13,957	287	7,465	6,748
1942†	19,000	325	8,800	10,200

†Preliminary.

*Including correction for inventory differences.

March Tax Tag Sales

Fertilizer tax tag sales in the South were substantially larger in March of this year than last, with 10 of the 12 States reporting increases. This rise much more than offset a moderate decline in the Midwest, resulting in an 18 per cent increase in sales for the month in the entire 17 reporting States. Sales were somewhat below March, 1941, which reflects the earlier buying this year.

In the first quarter of the year sales were 10 per cent above the corresponding period of 1942. Increases occurred in all States except two in the South and two in the Midwest.

Sales in March were less than in February, in contrast to what was the normal seasonal trend in earlier years. In the years 1939, 1940, and 1941, sales in the first four months of the year as percentages of the January–March average, were: January 52, February 81, March 168, and April 140. This year, as percentages of the January–March average, January was 83, February 112, and March 105. When the April results become known it will be possible to determine more accurately how much of the increase in January–March was due to early buying and how much to increased fertilizer consumption.

FERTILIZER TAX TAG SALES*

STATE	March 1943 Tons	March 1942 Tons	March 1941 Tons	% '42	January–March 1943 Tons	January–March 1942 Tons	January–March 1941 Tons
Virginia	90,541	69,852	74,304	95	215,235	226,370	171,473
North Carolina	258,906	184,951	310,558	96	777,289	813,807	564,688
South Carolina	184,537	143,014	265,216	116	547,747	472,739	435,254
Georgia	289,963	243,953	343,482	124	698,176	561,745	513,384
Florida	66,690	50,460	53,517	116	244,160	211,177	203,905
Alabama	164,250	163,600	146,950	115	481,000	416,650	271,850
Mississippi	69,129	55,525	70,313	124	240,936	194,440	203,252
Tennessee	43,415	35,771	10,410	126	99,766	79,350	40,018
Arkansas	37,760	29,750	25,800	111	110,550	100,000	72,800
Louisiana	39,100	44,489	37,830	107	107,913	100,436	98,930
Texas	36,475	39,453	26,817	106	89,180	84,033	69,797
Oklahoma	2,721	2,255	2,110	210	12,171	5,805	7,796
TOTAL SOUTH	1,283,487	1,063,073	1,367,307	111	3,624,123	3,266,552	2,653,147
Indiana	34,450	35,018	65,079	86	156,800	182,586	135,687
Illinois	12,542	18,103	16,881	116	46,722	40,293	21,029
Kentucky	31,963	26,940	20,348	98	64,378	65,721	45,749
Missouri	8,222	18,048	16,670	131	37,074	28,396	30,483
Kansas	696	614	816	218	1,999	919	5,033
TOTAL MIDWEST	87,873	98,723	119,794	97	306,973	317,915	237,981
GRAND TOTAL	1,371,360	1,161,796	1,487,101	110	3,931,096	3,584,467	2,891,128

* Monthly records of fertilizer tax tags are kept by State control officials and may be somewhat larger or smaller than the actual sales of fertilizer.

FERTILIZER MATERIALS MARKET

NEW YORK

Domestic Allotments of Triple Superphosphate Expected Shortly. Ceiling on Superphosphate Prices Established. Sulphate of Ammonia Shipments Slow. More Nitrate of Ammonia Expected. Potash Supplies Should Be Adequate

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, April 6, 1943.

Due to agitation caused by the tremendous need for high test superphosphate, latest advices are now that shipments against Lend-Lease orders will be suspended as of April 7th and shipments of triple superphosphate will be made to domestic users, either for a 30-day period or for the rest of this month, at any rate. It is expected that Washington will instruct that certain sections of the country, principally New England, should be given priority and certain quantities shipped to that section first of all, which is for use principally by potato growers.

In spite of the allocation made of North African phosphate for England, certain large quantities of North African rock have been shipped into this country.

Certain users of triple superphosphate are now trying to determine whether this material will be available for their use for the new season but until some decision is made as to what portion of this country's production will continue to be shipped abroad, naturally no estimate can be made as to what will be available for domestic use.

The Office of Price Administration has recently issued price ceiling orders on all grades of superphosphates, prices having been increased due to the increased costs involved, principally in the handling of raw materials by rail instead of by boat and increased labor costs.

Sulphate of Ammonia

This material is continuing to move against contracts, but in most cases, suppliers are not up to date on deliveries and practically no material is available for April for new business although business can be booked at the present time, for May shipments, provided material has been allocated.

Nitrate of Soda

The market is firm, with no change in the price, with material being delivered on allocation only.

Nitrate of Ammonia

The nitrate of ammonia which was shipped into this country by Canadian producers, according to recent advices, has been completely absorbed and it is expected that further quantities will soon be released.

Potash

No new seasonal prices have been determined as yet but it is expected that domestic production will be sufficient to take care of domestic needs and, per order M-291, the War Production Board approval will be necessary to ship any material in the new season, the same as applies for spot sales at the present time.

PHILADELPHIA

Superphosphate Ceilings Announced. Materials Scarce in All Lines. Vegetable Potash Sources Being Explored.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, April 7, 1943.

During the past couple of weeks, the long awaited ceilings on superphosphates were published, and that seems to be the biggest piece of news. Otherwise, the advance of the spring season working northward, has just increased demand for already scarce materials.

Ammoniates.—Still scarce, with no supplies turning up. Still limited quantities of lower-analysis organics are available, but with tightening prices.

Sulphate of Ammonia.—Output is being absorbed on old contracts, leaving nothing to offer for new sales.

Nitrate of Soda.—This material, of course, still remains under allocation.

Superphosphate.—Ceilings have been established for this material. It appears as though these new prices are generally satisfactory to the trade.

Bone Meal.—Still in very tight position, with prices holding firm.

Potash.—Supply not plentiful, with some users turning toward vegetable sources of the element.

BALTIMORE

Shortage of Labor Handicaps Spring Shipping Season. Liquid Ammonia Allotments Fail to Solve Chemical Nitrogen Problem. Ceiling Prices on Superphosphate.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, April 6, 1943.

The fertilizer industry is now in the midst of the heaviest shipping season of the year, and like many other industries is suffering from lack of labor. There have been no outstanding features in connection with the business since last report, and all energies are now directed toward getting out the utmost tonnage during the present spring season.

Organics.—The demand continues unabated, but both tankage and blood are being absorbed by the feeding trade, due to higher ceiling prices prevailing.

Nitrogenous Material.—The market is bare of offerings, and the demand for vegetable meals for feeding purposes has left no surplus for fertilizer.

Sulphate of Ammonia.—While further quantities of ammonia in the form of liquid ammonia have been released to fertilizer manufacturers, there is still a shortage, as they are only able to use a limited amount of liquid ammonia in their mixtures. There is no sulphate of ammonia offering on the resale market as such.

Nitrate of Soda.—The Government continues to make more liberal allocations to conform with seasonal requirements, which are usually heaviest at this time of the year.

Potash.—There has been no activity in this material, and it is quite evident that domestic manufacturers have been able to take care of actual legitimate requirements of American fertilizer manufacturers, and the situation will doubtless continue as soon as they are ready to book contracts for another year.

Superphosphate.—New order has just been issued by OPA basing prices on this material at various producing points, and taking into account rail rates from rock mines to destination. Ceiling prices at Baltimore are slightly higher than the present market of 60 cents per unit, but it is quite likely that, as soon as manufacturers are ready to sell for future delivery, ceiling prices will prevail, due to increased cost of production since last advance.

Bone Meal.—The market continues firm on both raw and steamed bone meal, with offerings practically nil, and demand light.

Bags.—According to latest OPA regulations it is now again permissible to use new burlap bags for shipment of fertilizer, but practically all manufacturers have already arranged to ship their spring production in paper and second-hand bags, and on account of the wide difference in price between these and new bags, there is very little interest being shown in the latter, and probably will not be for some time to come.

CHARLESTON

Liquid Ammonia Being Distributed. Labor Shortage Felt. Few Offerings of Organics of Any Sort.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, April 5, 1943.

Manufacturers are now receiving relief by being allowed additional liquid ammonia, but most fertilizer manufacturers are behind in their shipments, due to shortage of labor.

Nitrogenous.—No further information is available, beyond the fact that there is none being offered.

Castor Meal.—Fairly large amounts of beans arrived during March, but producers are still not able to offer.

Dried Blood.—This material is quoted at

$5.38 per unit ammonia ($6.54 per unit N) unground, but feeders are still having difficulty getting their supply.

Cottonseed Meal.—Quotations are nominal; 8 per cent grade, Atlanta, $38.60. Soya meal, $45.75.

CHICAGO

Fertilizer Organics in Light Supply Due to Labor Shortage. Ceiling Prices Prevail. No Change in Feed Market.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, April 5, 1943.

Organics remain in exceeding light supply with heavy demand. Indications point to the continuation of this situation throughout the present season, unless an improvement in producers' ability to obtain labor should occur. Such few trades that are passing are at full ceiling prices.

No change has taken place in the feed market. Supplies are lacking while demand remains active.

No change in ceiling prices. High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.38 ($6.54 per unit N); dry rendered tankage, $1.21 per unit of protein, Chicago basis.

TENNESSEE PHOSPHATE

Outdoor Work Proceeding Vigorously. V-C Seeking New Water Supply. Rock for Direct Application Shows Noted Increase.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., April 5, 1943.

The first two weeks of spring ending today have given the usual assortment of weather, but, on the whole, good balmy spring days have predominated and outdoor work by farmers is rushing along. Construction, prospecting new properties and new mine locations, active mining and transporting and other outdoor work of the phosphate industry are all in active progress.

Tobacco beds are for the most part up in good shape and preparation of ground for early setting out of plants is actively under way.

The Charleston Mining Branch of the V-C Chemical Co. is drilling a deep well at Arrow Mines near Mt. Pleasant, expecting to strike a good water table at the Knox Dolomite several hundred feet down, to supplement the frequently inadequate supply from surface streams, on which the field now depends.

The construction work at Hoover & Mason plant, including new bagger and two new mills, is making rapid progress and all should be in full operation before the end of April.

Shipments of ground phosphate rock for direct application are proceeding at the most rapid rate possible with all mills steadily operating day and night. There is no stored material on hand to take care of the extra seasonal demand, so customers are simply clamoring for shipment. The first quarter of 1941 was the largest shipping period of that part of the calendar ever experienced in the history of the field, 1942 was about 20 per cent larger, and so far in 1943, the volume into that consuming channel has been 72 per cent larger than 1942. Much more interest is being manifested in states other than Illinois where the great preponderance of this form of phosphate has been used for forty years, and it is being more and more borne into the consciousness of agricultural circles that this best of all soil builders, which always leads to more commercial fertilizer being used with much more profit to the user, has been sadly overlooked.

Boron and Potash for Alfalfa in the Northeast

(Continued from page 9)

the drought, no effect of potash on growth up to that date was to be expected.

Since potash as yet had had no effect, there are in reality duplicate plots of untreated and of boron-treated alfalfa. On the basis of 15 per cent of moisture in the hay, the average of two no-boron plots was 1566 lbs. and that of two boron-treated areas, 2120 lbs. of hay to the acre. Although the yield was not large, boron increased it one-third, or at a rate of more than one-fourth ton of good alfalfa hay to the acre. On the basis of an unharvested, field value of $8.00 a ton, the hay produced by the borax added was worth about twice its cost. In two other tests, there was enough rain for the treatment to become effective. In one, the growth was materially increased by boron. In the other, the boron-treated alfalfa set a heavy crop of seed despite severe drought through July and most of August. The alfalfa with no added boron set almost no seed.

It will be highly desirable to take yields over the next two years on these and about 70 additional tests with boron and potash on alfalfa in northern and eastern New York that were established in 1942 by McAuliffe and Dawson, and also the earlier ones by Colwell.

As is well known, a 10-ton application of average farm manure supplies about 100 lbs. of potash. Alfalfa or clover hay contains about 40 lbs. of potash to the ton. This quantity of manure supplies the potash required for 2½ tons of hay. We must, of course, expect legumes to obtain a considerable part of their requirements from the soil itself. Ten tons of manure, therefore, may be expected to be of real service over a period of two years.

A few observations apply to boron. On one field about 17 tons of manure were applied for alfalfa in the spring of 1942. The first cutting looked like at least 3 tons an acre. The second growth showed distinct symptons of boron deficiency in parts of the field. Even so, the yield was fairly satisfactory. Normal rates of application of manure produced from crops grown on borondeficient soils do not solve the borondeficiency problem.

It is obviously impossible for an experiment station to conduct tests on a number of alfalfa fields sufficient to determine the boron and potash needs for an entire state. It is definitely urged, therefore, that farmers be encouraged to establish tests similar to those described on their own fields wherever even mild symptons of deficiency of either boron or potash have been observed. A good idea of the effect of this treatment on yields is essential for a decision as to whether borax or potash treatment pays on a particular farm.

On fields known to be deficient in boron and potash, the use of 30 to 40 lbs. of borax and 200 to 400 lbs. of muriate of potash to the acre should prove unusually profitable in this section of the country.

It is important not to lose sight of the fact that drought intensifies symptoms, especially of boron deficiency, and that more than normal rainfall obscures these symptoms. Because excessive liming, particularly on light soils, intensifies the effects of a lack of sufficient abailable boron, liming should be restricted to the known needs of alfalfa and clover.

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INFORMATION PLEASE—ABOUT CYANAMID

Field and laboratory research in wartime strengthens and quickens the processes that lead to victory. It also contributes much that will prove extremely useful in peacetime pursuits when the war is over.

After more than 35 years in the business of making and testing Cyanamid under varying conditions, additional research gives us valuable information regarding new uses—some of which are remarkable.

This information will be released to the fertilizer industry and to agriculture just as rapidly as conditions permit.

While we work out the problems of today, we are getting answers that will be helpful in solving the problems of tomorrow.

AMERICAN CYANAMID COMPANY
FERTILIZER DIVISION
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

Landis Awarded A. I. C. Medal

Dr. Walter Savage Landis, vice president of the American Cyanamid Company, has been awarded the Gold Medal of the American Institute of Chemists which will be presented at the annual meeting of the Institute to be held in May.

This medal, which is awarded annually for outstanding services to the science of chemistry, is being presented to Dr. Landis not only in recognition of his contributions to chemical engineering and development work, largely in the field of nitrogen derivatives, but also for his services to the professional side of chemistry.

Among Dr. Landis' accomplishments is the development of a method for the fixation of atmospheric nitrogen by producing ammonia from cyanamid and oxidizing it to nitric acid; and he was concerned with the engineering of the first American plant for using this process, erected during World War I, when the nation was faced with "nitrogen starvation." He likewise designed the first portable hydrogen generator for inflating military balloons, largely used by the American forces.

At this time, he was also consultant for many industrial groups who were faced with problems in the production of munitions, but were without experience in this field.

His technical developments include processes for the production of hydrocyanic acid, cyanides, ferrocyanides, dicyandiamid, and urea from cyanamid.

Dr. Landis is a graduate of Lehigh University with the degree of metallurgical engineer (1902), M.S. (1906), and the honorary degree of Sc.D. (1922). During 1905 and 1906, he studied mineralogy and crystallography at Heidelberg, Germany, and spent some time at the Krupp Institute in the Technical High School at Aachen, in 1909. He later taught in the Department of Mineralogy and Metallurgy at Lehigh, resigning as associate professor in 1912 to join the American Cyanamid Company as chief technologist. He has been actively associated with this company ever since. He established its first research laboratory in 1913, was made a director in 1922, and vice president in 1923.

Many patents have been granted to Dr. Landis, and he is the author of numerous articles on chemical, financial, and economic subjects. Throughout his career, he has spent much time and effort towards raising the professional standard of chemists.

Dr. Landis has been chairman of the New York Section of the American Chemical Society, chairman of the New York Section of the Electrochemical Society, president of the National Electrochemical Society, and a member of the Chemist Advisory Council. He is a member of the American Institute of Chemical Engineers, the American Institute of Mining and Metallurgical Engineers, and the American Institute of Chemists, president of the Chemists' Club, New York, a trustee of Lehigh University, and a member of the honorary scientific societies, Tau Beta Pi, Sigma Xi, and Epsilon Chi. He has been presented with the Chemical Industry Medal and the Perkins Medal.

Carruth Named Executive Vice-President of Union Bag & Paper Corporation

Henry P. Carruth, Vice-President of the Brown Company in Berlin, New Hampshire, will shortly join the Union Bag & Paper Corporation as Executive Vice-President according to an announcement made by Alexander Calder, President of Union Bag & Paper Corporation.

Mr. Carruth studied chemical engineering at Massachusetts Institute of Technology. He entered the paper business in 1906 and later became Vice-President of the Mead Corporation and President of its wholly owned subsidiary, Dill & Collins.

In 1936 he became associated with the Brown Company as General Manager for the Trustees. He served in this capacity until its reorganization in 1941 and then became Vice-President and Chief Executive Officer.

Mr. Carruth is also a member of the Industry Advisory Committee of the War Production Board.

Fertilizer Production by States

Indiana

The figures published by the Indiana authorities show that fertilizer sales during 1942 amounted to 334,593 tons, an increase of 22 per cent over the 273,386 tons sold in 1941. The sales were divided between spring and fall in the proportion of 220,709 tons in the spring and 114,174 tons in the fall. Slightly more than 80 per cent of the total tonnage of mixed fertilizers was concentrated in 10 grades: 0–12–12, 2–12–6, 0–14–7, 0–20–20, 0–8–24, 3–12–12, 0–14–6, 0–14–14, 2–12–12 and 2–8–16. It is to be noted that every one of these grades contains 20 per cent or more of plant food.

Iowa

The report on fertilizer consumption in Iowa in 1942, by Dr. W. H. Pierre of Iowa State College, shows a grand total consumption for the year of 40,579 tons of fertilizer, of which mixed fertilizer distributed by the industry totaled 19,567 tons; materials distributed by the industry, 5,794 tons; superphosphate distributed through AAA, 13,035 tons; phosphate distributed by TVA, 229 tons; phosphate-potash fertilizer distributed by AAA, 1,955 tons. The total of mixed fertilizer and materials distributed by the industry was 25,361 tons, which is to be compared with 17,361 distributed in 1941, an increase of 46.6 per cent. The ten leading grades, in order of rank, were: 2–12–6, 0–12–12, 3–14–6, 0–9–27, 2–8–16, 3–12–12, 2–16–8, 0–14–6, 2–12–2, and 0–20–10. The tonnage of these ten grades was 88 per cent of the total tonnage of mixed fertilizer sold.

U. S. Fertilizer Officials Move Offices

The Food Production Administration announces the following new addresses:

George M. Worman, Field Service Representative, Fertilizer Division, Food Production Administration, who serves the Northeastern States, is now located at U. S. Department of Agriculture, 56 Hillhouse Ave., New Haven, Conn.; telephone, New Haven 8–3082.

John P. F. Ritz, Field Service Representative, Fertilizer Division, Food Production Administration, who serves Maryland, Pennsylvania, Delaware, and West Virginia, is now located at the Farm Credit Bldg., St. Paul & 24th Sts., Baltimore, Md.; telephone, University 9100.

Directive on Fertilizers for Mid-West Corn

The Food Production Administration has issued Directive 2 under Food Production Order 5. It relates to the distribution and delivery of mixed chemical fertilizer containing chemical nitrogen for use on field corn in certain Middle Western States and requires each fertilizer manufacturer, dealer, or agent: (1) to make provision for delivery of all such fertilizer for use on field corn; (2) to make provision for delivering to all his customers 50 per cent of their requirements for use on field corn before delivering to any particular customer more than 50 per cent of his requirements for such use; (3) to deliver to each customer, so far as practicable, the same percentage, in excess of 50 per cent, of his requirements for use on field corn; and (4) to make available as high percentage of such fertilizer for use on other "B" crops as for use on field corn. The text of the Directive follows:

Directive 2—(a) Distribution and delivery of chemical fertilizer containing chemical nitrogen for use on field corn. Pursuant to the provisions of paragraphs (d) (1) and (d) (2) of Food Production Order No. 5, the distribution and delivery of chemical fertilizer containing chemical nitrogen for use on field corn

See Page 4

in Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin, shall be governed by the following directions:

(1) Before making delivery of mixed chemical fertilizer containing chemical nitrogen to any person for use on field corn in the above-mentioned States, fertilizer manufacturers, dealers, or agents shall accept any applications received for such fertilizer for use on Group A crops and provide for delivery of such fertilizer for use on such Group A crops as provided in paragraph (h) (3) of Food Production Order No. 5.

(2) Before delivering mixed chemical fertilizer containing chemical nitrogen to any person for use on field corn in the above-mentioned States, in excess of 50 per cent of such person's requirements, fertilizer manufacturers, dealers or agents shall first make provision for delivering such fertilizer to the extent of 50 per cent of the requirements of all eligible applications for such fertilizer for use on field corn in the above-mentioned States.

(3) In delivering mixed chemical fertilizer containing chemical nitrogen to persons in the above-mentioned States for use on field corn in excess of 50 per cent of the requirements of such persons, fertilizer manufacturers, dealers or agents shall, so far as practicable, deliver to each of such persons the same percentage of his requirements.

(4) Fertilizer manufacturers, dealers or agents shall make available as high a percentage of mixed chemical fertilizer containing chemical nitrogen for delivery and use on other Group B crops as is made available for use on field corn.

Ceiling on Superphosphate Prices Prices to Fertilizer Manufacturers Established

(Continued from page 11)

(*b*) The product of the number of units contained therein in excess of 20 units times the applicable maximum price per unit for triple superphosphate, basis f. o. b. cars at the producing point (ii). If the producer of such double superphosphate is not a producer of triple superphosphate, his applicable maximum price, for calculations required in this paragraph, shall be his actual delivered cost of triple superphosphate, or if none was purchased, the maximum price as established in (ii) (*b*) (*4*).

(iv) *Sales of superphosphate in bags.* The maximum price a producer may charge for superphosphate for sales in bags to fertilizer manufacturers or mixers shall be the applicable maximum price for bulk sales as determined under (i), (ii), or (iii) above, plus $1.00 per ton of 2000 pounds, plus the producer's actual cost of the bags used to package 2000 pounds.

(v) *Sales of superphosphate to Government departments and agencies.* The maximum price a producer may charge for sales of superphosphate to the United States Treasury, the United States Department of Agriculture or any agency of the United States shall be the applicable maximum price as established under (i), (ii), (iii) or (iv) above.

(vi) *Sales of superphosphate for export.* The maximum price a producer may charge for sales of superphosphate for export shall be determined in accordance with the provisions of the Revised Maximum Export Price Regulation issued by the Office of Price Administration.

(vii) *Resales of double or triple superphosphate.* The maximum price which one fertilizer manufacturer or mixer may charge another fertilizer manufacturer or mixer for the sale of double or triple superphosphate not produced by the seller shall be his delivered cost of such superphosphate plus $3.00 per ton of 2000 pounds.

This amendment shall become effective March 30, 1943.

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

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St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill.
Union Bag & Paper Corporation, New York City.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Textile Bag Mfrs. Association, Chicago, Ill.

BAGS—Paper
Bagpak, Inc., New York City
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Union Bag & Paper Corporation, New York City.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill,
Union Bag & Paper Corporation, New York City.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

BAG CLOSING MACHINES
Bagpak Inc., New York City.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City.
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Link-Belt Company, Philadelphia, Chicago
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag Line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Huber & Company, New York City.

CHEMICALS—Continued
International Minerals & Chemical Corporation, Chicago, Ill
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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DISINTEGRATORS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DRYERS—Direct Heat
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Company, New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Company, Columbus, Ohio.
International Minerals and Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, In l.

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MACHINERY—Power Transmission
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Pumping
Atlanta Utility Works, East Point, Ga.
Duriron Co., Inc., The, Dayton, Ohio.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MAGNETS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS
Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS
Chemical Construction Corp., New York City.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Virginia-Carolina Chemical Corp. (Mining Dept.), Richmond, Va.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
Duriron Co., Inc., The, Dayton, Ohio.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

QUARTZ
Charlotte Chem. Laboratories, Inc., Charlotte, N. C

RINGS—Sulphuric Acid Tower
Chemical Construction Corp., New York City.

ROUGH AMMONIATES
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

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SCALES—Including Automatic Bagging
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCRAPERS—Drag
Hayward Company, The, New York City.

SCREENS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Magnetic
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHAFTING
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corporation, Chicago, Ill., and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Hydrocarbon Products Co., New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Freeport Sulphur Co., New York City.
Texas Gulf Sulphur Co., New York City.

SULPHURIC ACID
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M. Charleston, S. C.

SULPHURIC ACID—Continued
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City.

TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Smith-Rowland, Norfolk, Va.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

TANKS
Sackett & Sons, Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

UNLOADERS—Car and Boat
Hayward Company, The, New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
DuPont de Nemours & Co., E. I., Wilmington, Del.

UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

VALVES—Acid-Resisting
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

WHEELBARROW (See Carts)

ZINC SULPHATE
Tennessee Corporation, Atlanta, Ga.

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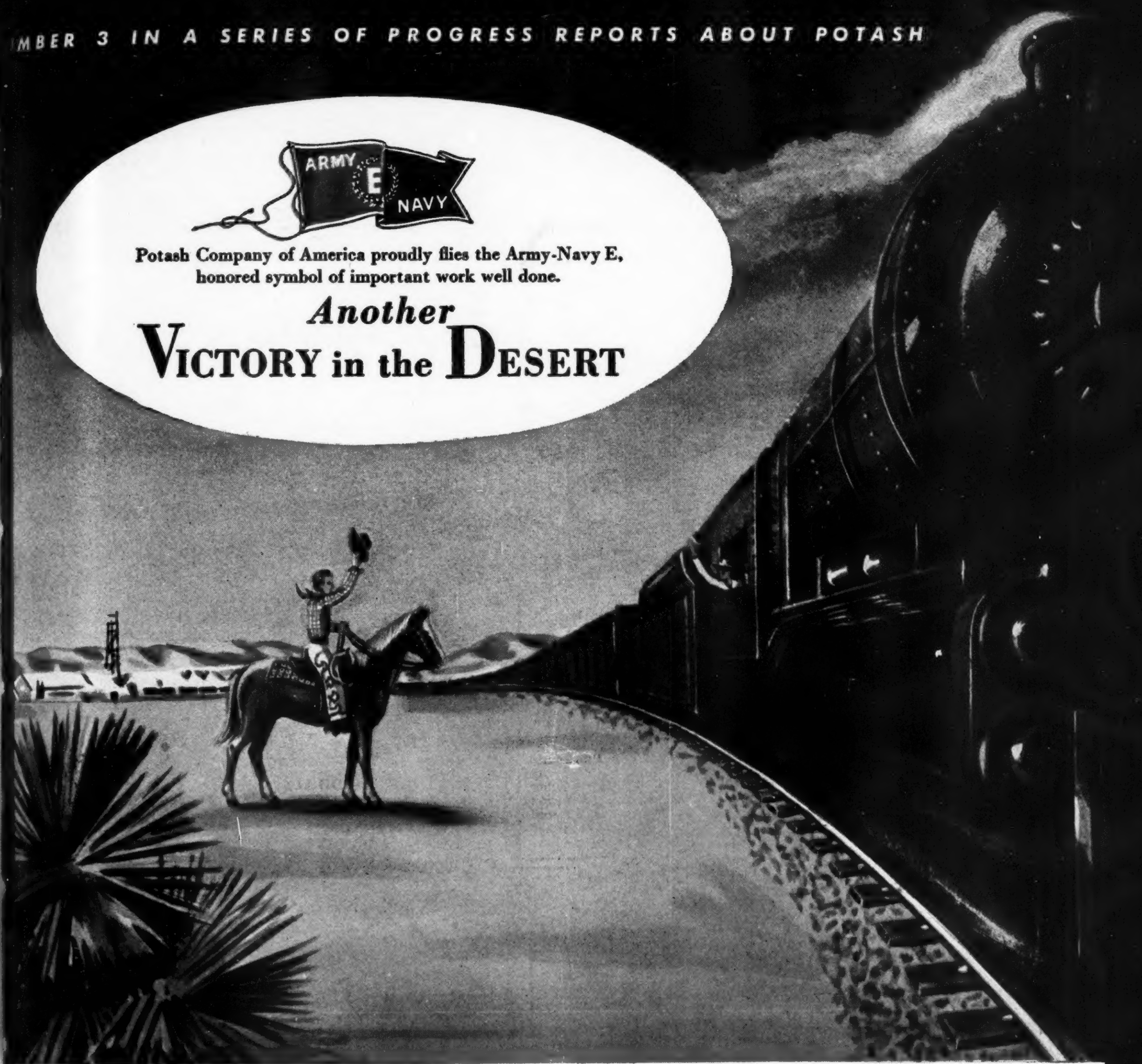

PEACE-TIME VICTORY IN DESERT PAYS WAR-TIME DIVIDENDS TODAY

The Potash industry in America is delivering more than twice as much potash—in terms of K2 O—to agriculture and industry as it did in 1939, the first war year. Neither wage increases, freight costs, nor other expenses, have been allowed to push up the price. Actually Muriate of Potash today is $10 per ton less than it cost when World War I started. Multiply this difference by the number of tons delivered—more than a million—that's what we mean by war-time dividends! That's what victory in the desert of New Mexico means to you.

Potash Company of America is proud of its own part in winning the great victory in an American desert. It is proud, too, of the co-operation of the fertilizer industry which has been one of the big guns in the tough battle.

P.C.A. RED MURIATE

POTASH COMPANY OF AMERICA

CARLSBAD, NEW MEXICO

GENERAL SALES OFFICE...50 Broadway, New York, N. Y. • SOUTHERN SALES OFFICE...Mortgage Guarantee Building, Atlanta, Ga.

OF SODA